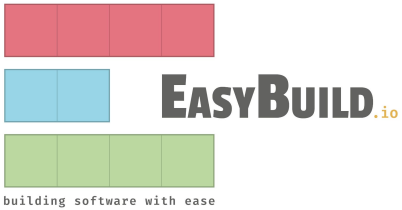
What if you no longer have to install

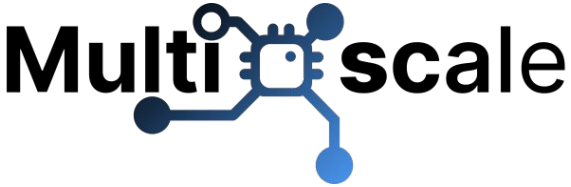
*a **broad range of scientific software***

from scratch on every laptop, HPC cluster,

or cloud instance you use or maintain,

without compromising on performance?





Status Update on EESSI

EUROPEAN ENVIRONMENT FOR SCIENTIFIC SOFTWARE INSTALLATIONS

Lara Peeters (Ghent University)

11th EasyBuild User Meeting - 23 April 2026

Major goals of EESSI

- Providing a truly **uniform software stack**
  - Use the (exact) same software environment everywhere
  - **Without sacrificing performance** for “mobility of compute” (like is typically done with containers/conda)
- **Avoid duplicate work** (for researchers, HPC support teams, sysadmins, …)
  - Tools that automate software installation process (EasyBuild, Spack) are not sufficient anymore
  - Go beyond sharing build recipes => work towards a shared software stack
- Facilitate HPC training, development of (scientific) software, …

Demo time!

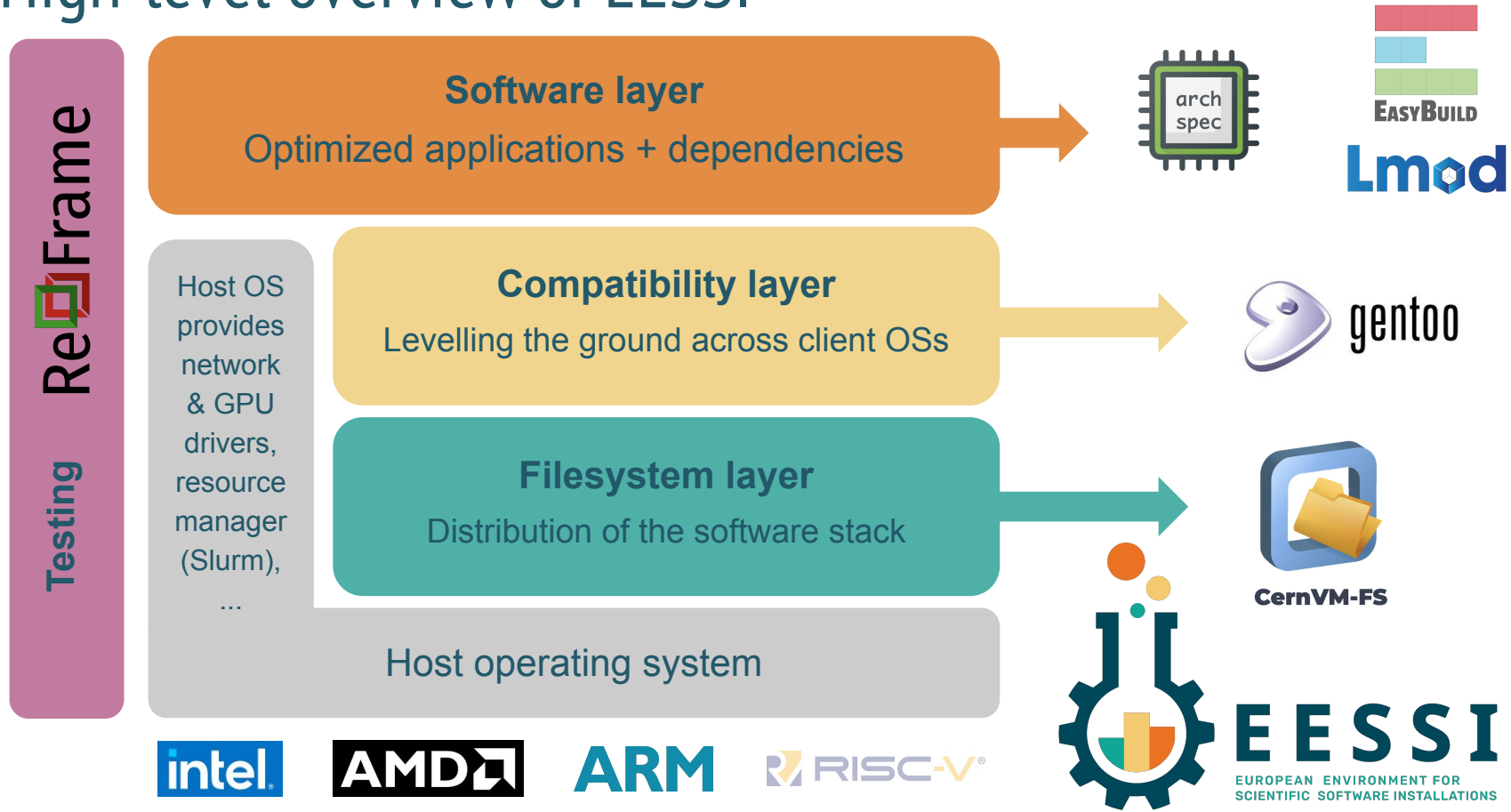
Demo: Using EESSI

eessi.io/docs/using_eessi/eessi_demos

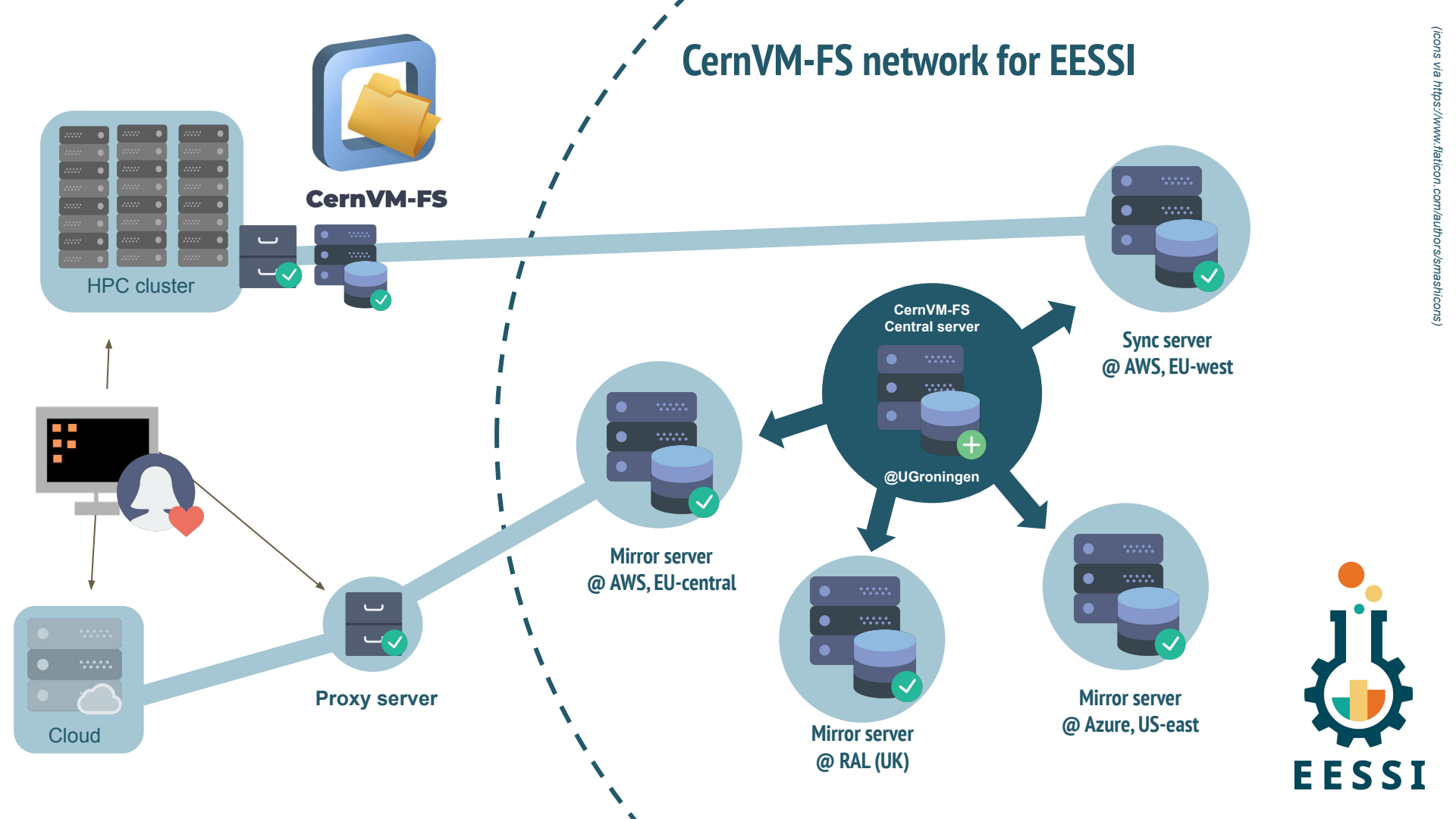
```
/cvmfs/software.eessi.io/versions/2023.06/software
`-- linux
    |-- aarch64
       |-- generic
       `-- neoverse_n1
       `-- neoverse_v1
       `-- a64fx
       `-- nvidia
           |-- grace
    `-- x86_64
        |-- amd
        |   |-- zen2
        |   `-- zen3
        |   `-- zen4
        |   `-- zen5
        |-- generic
        `-- intel
            |-- haswell
            `-- cascadelake
            `-- icelake
            `-- sapphirerapids
            `-- skylake_avx512
                |-- modules
                `-- software
```

```
$ source /cvmfs/software.eessi.io/versions/2025.06/init/lmod/bash
Modules purged before initialising EESSI
Module for EESSI/2025.06 loaded successfully
EESSI has selected x86_64/amd/zen2 as the compatible CPU target
for EESSI/2025.06 Automatically detects CPU microarchitecture
EESSI did not identify an accelerator on the system
(for debug information when loading the EESSI module, set the
environment variable EESSI_MODULE_DEBUG_INIT)

{EESSI 2023.06} $ module load R/4.5.1-gfbf-2025a

{EESSI 2023.06} $ which R
/cvmfs/software.eessi.io/versions/2025.06/software/linux/x86_64/
amd/zen2/software/R/4.5.1-gfbf-2023a/bin/R

{EESSI 2023.06} $ R --version
R version 4.5.1
```

High-level overview of EESSI



CernVM-FS network for EESSI



(icons via https://www.flaticon.com/authors/smashicons)

Accessing EESSI via CernVM-FS

```
# Native installation
# Installation commands for RHEL-based distros
# like CentOS, Rocky Linux, Almalinux, Fedora, ...

# install CernVM-FS
sudo yum install -y
https://ecsft.cern.ch/dist/cvmfs/cvmfs-release/cvmfs-release-latest.noarch.rpm
sudo yum install -y cvmfs

# create client configuration file for CernVM-FS
# (no proxy, 10GB local CernVM-FS client cache)
sudo bash -c "echo 'CVMFS_CLIENT_PROFILE="single"' > /etc/cvmfs/default.local"
sudo bash -c "echo 'CVMFS_QUOTA_LIMIT=10000' >> /etc/cvmfs/default.local"

# Make sure that EESSI CernVM-FS repository is accessible
sudo cvmfs_config setup
```

Alternative ways of accessing EESSI are available, via a container image, via cvmfsexec, …
eessi.io/docs/getting_access/native_installation - eessi.io/docs/getting_access/eessi_container

New releases and developments

New releases and repositories

pilot.eessi.io

dead & buried (RIP)

software.eessi.io

2023.06

- Default one since June 2023
- **1189** software installed (total: 16,681)
- **6151** unique packages
- foss/(2022b+23a+23b) -> GCC 12.4 ↓

riscv.eessi.io

- Development versions of an EESSI RISC-V software stack
- Deprecated: part of dev.eessi.io

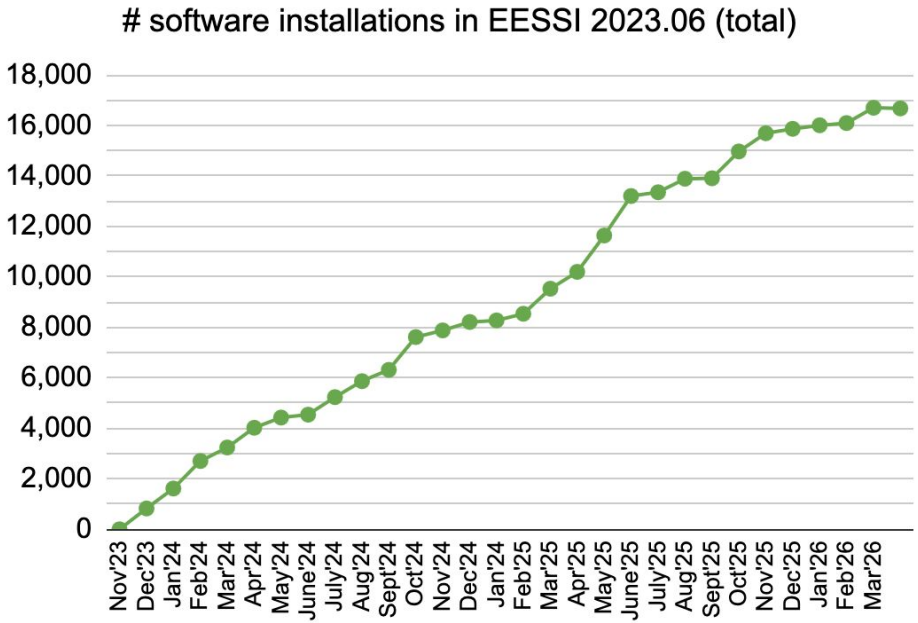
dev.eessi.io

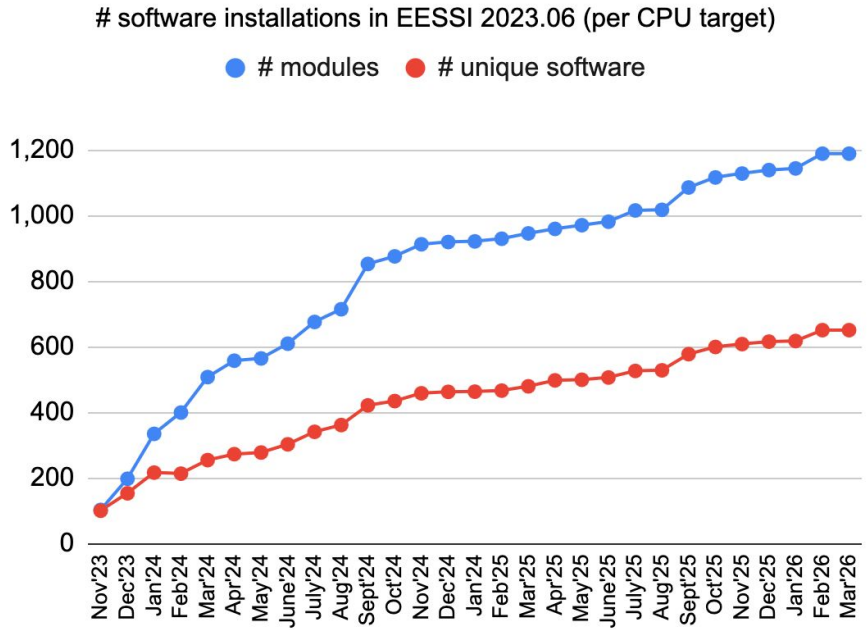
- Developer repository
- More about it later :)

2025.06

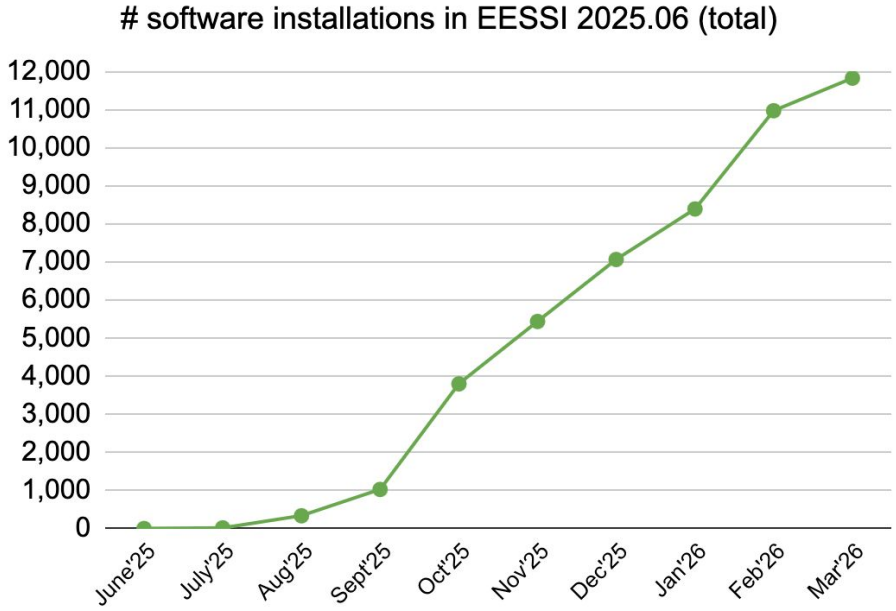
- Already available but ongoing effort to add more software
- **775** software installed (total: 11,821)
- **414** unique packages
- foss/(2024a+25a+25b) -> GCC 13.3 ↑

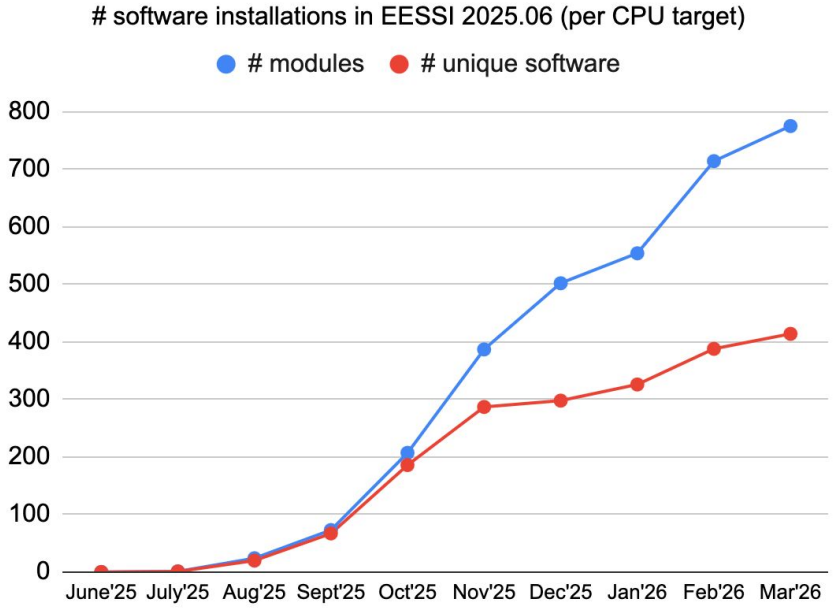
New software evolution (2023.06)



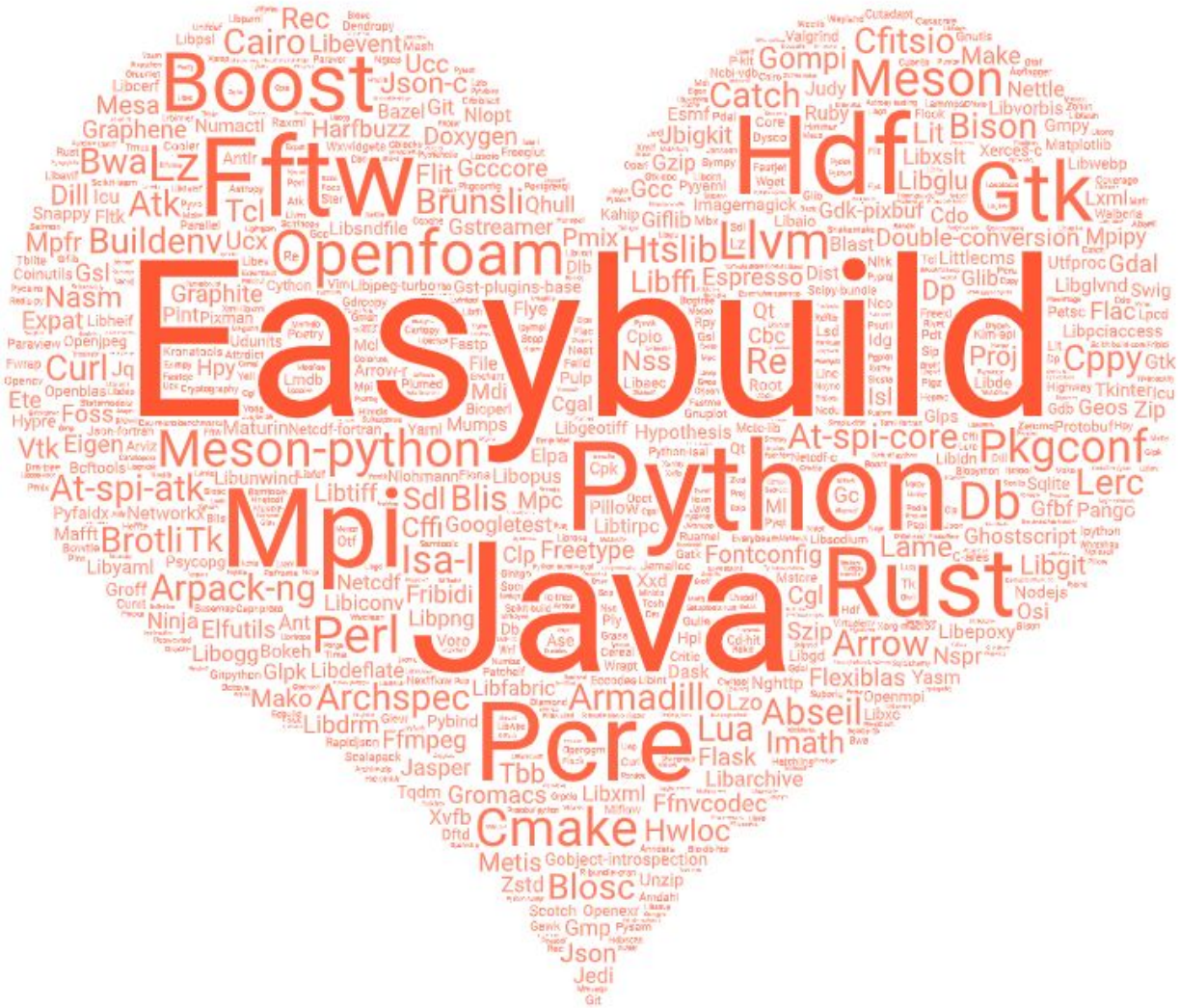


New software evolution (2025.06)

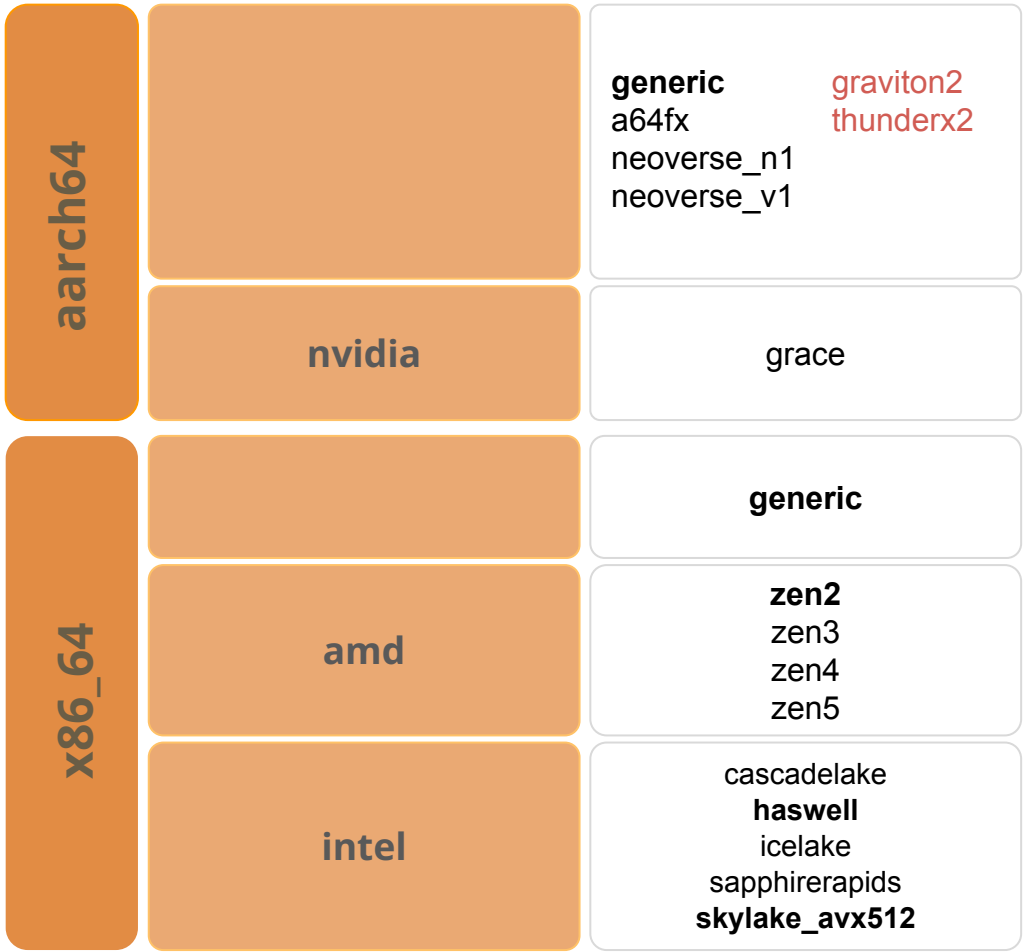




Wordcloud - software available in EESSI



(new) CPU targets



pink -> former architectures in pilot repository

bold -> from the beginning of the project

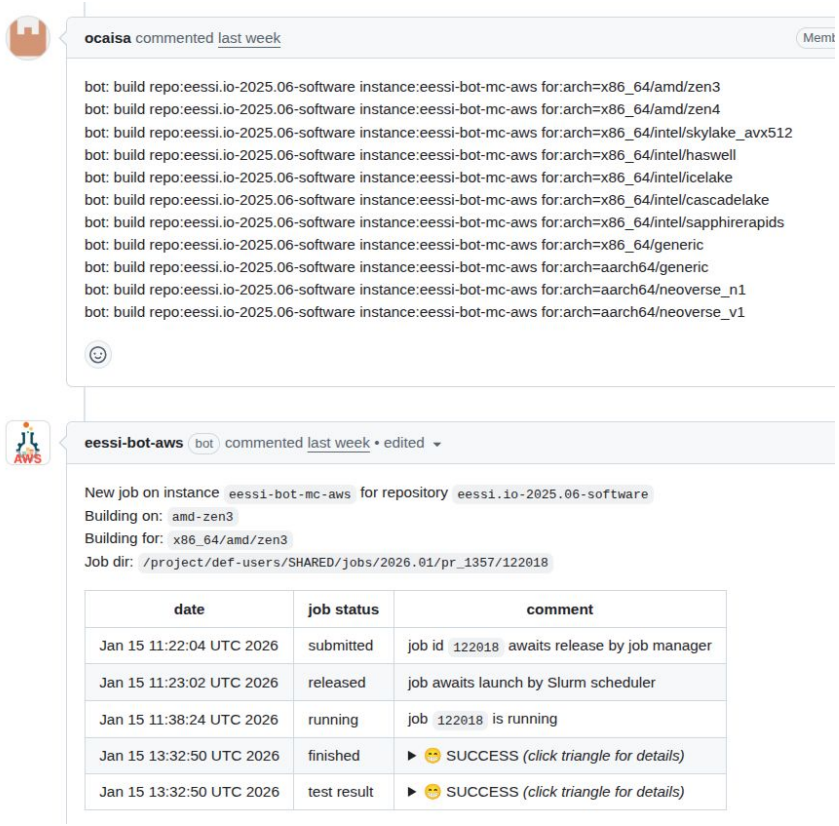
*A bit of a special one

GPU targets


nvidia
nvidia
2023.06: cc70 cc80 cc90
2025.06: cc70 cc80 cc90 cc100 cc120
(cc: CUDA compute capability)
amd (rocm)
Coming soon...

Build-test-deploy bot

- Build/Deploy/Ingest Strategy - Fully automatic or with human in the loop
- Interaction model: Plain CI, external CLI, GitHub App, …
  - GitHub App / scripts that understand(s) structured commands in PR comments, labels, and merge/close
- Whole CI infrastructure underneath:
  - GitHub runners, self-hosted runners ➔ HPC clusters (on-prem/Cloud), each running its own bot instance
- Bot only defines interface, repo owners define the actual build & test logic



ocaisa commented last week

bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/amd/zen3
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/amd/zen4
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/intel/skylake_avx512
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/intel/haswell
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/intel/icelake
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/intel/cascadelake
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/intel/sapphirerapids
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=x86_64/generic
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=aarch64/generic
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=aarch64/neoverse_n1
bot: build repo:eessi.io-2025.06-software instance:eessi-bot-mc-aws for:arch=aarch64/neoverse_v1

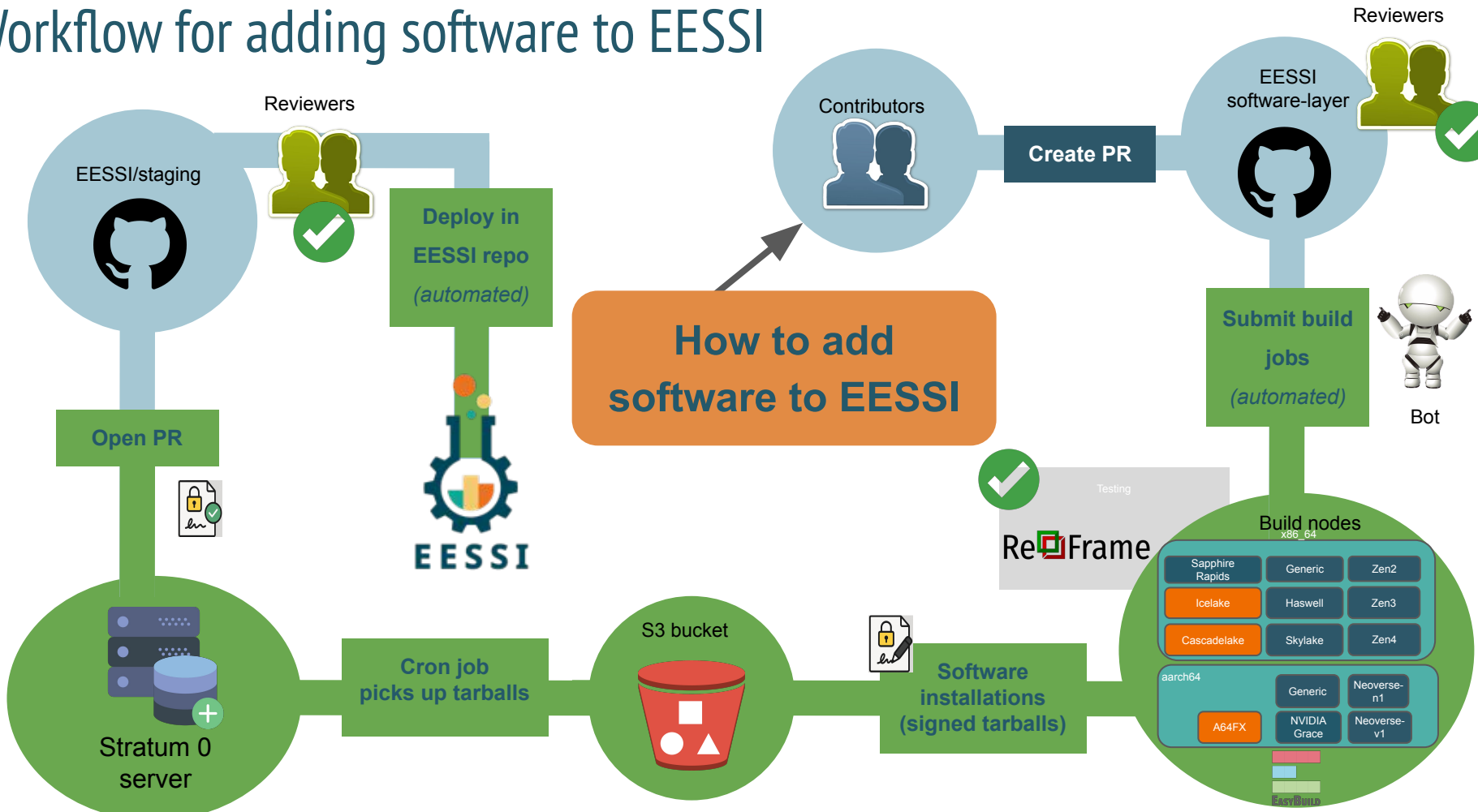
eessi-bot-aws bot commented last week • edited

New job on instance `eessi-bot-mc-aws` for repository `eessi.io-2025.06-software`
Building on: `amd-zen3`
Building for: `x86_64/amd/zen3`
Job dir: `/project/def-users/SHARED/jobs/2026.01/pr_1357/122018`

date	job status	comment
Jan 15 11:22:04 UTC 2026	submitted	job id `122018` awaits release by job manager
Jan 15 11:23:02 UTC 2026	released	job awaits launch by Slurm scheduler
Jan 15 11:38:24 UTC 2026	running	job `122018` is running
Jan 15 13:32:50 UTC 2026	finished	▶ 😁 SUCCESS *(click triangle for details)*
Jan 15 13:32:50 UTC 2026	test result	▶ 😁 SUCCESS *(click triangle for details)*

https://eessi.io/docs/bot

Workflow for adding software to EESSI



eessi.io/docs/software_layer/adding_software

Software testing is an important part of EESSI

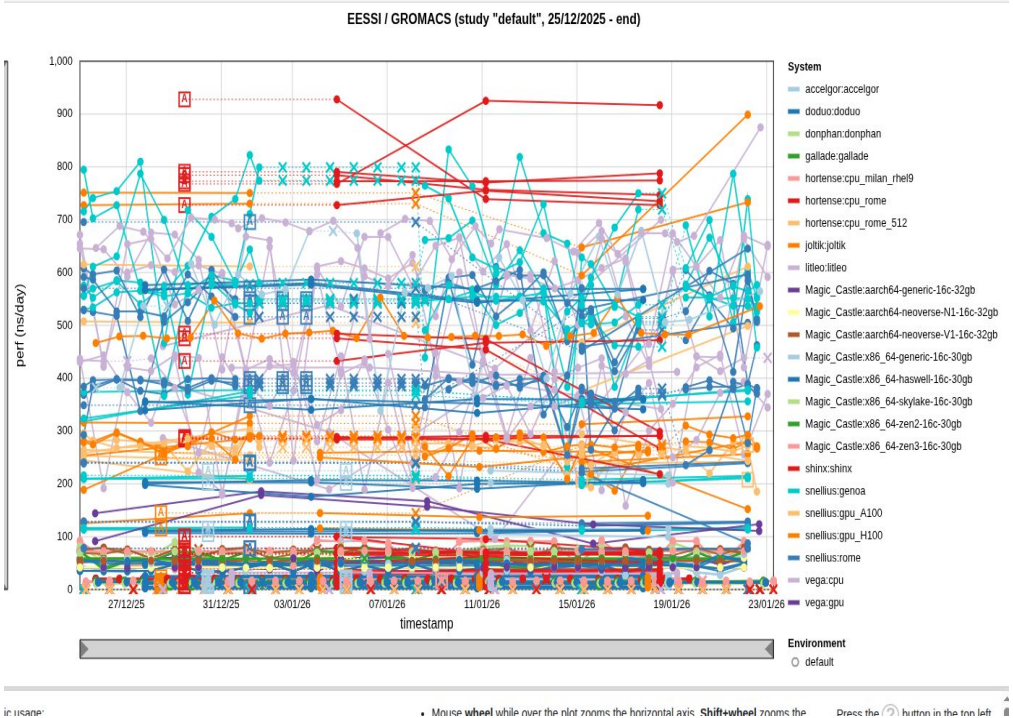
- Smoke test: sanity check commands are run by EasyBuild

  to check that installed software is not horribly broken while using EasyBuild

- Regression testing via EESSI test suite: eessi.io/docs/test-suite
  - Collection of portable tests for software available in EESSI
  - Running on selected (single node) tests when building new software for EESSI (before deployment)
  - Periodically (daily/weekly) on about multiple different systems
  - Can also be used for other software stacks (that are built with EasyBuild)
  - Periodic runs of EESSI test suite help to catch performance regressions

EESSI dashboard

- Centralized interface for visualizing results generated by the EESSI test suite. It supports a range of use cases, including:
  - System monitoring, providing insight into the health and stability of platforms where EESSI is deployed
  - Cross-system performance comparison
  - Aids in regression source identification
- Open to publish data from other systems, contact: support@eessi.io



https://dashboard.eessi.io

Building on top of EESSI improvements

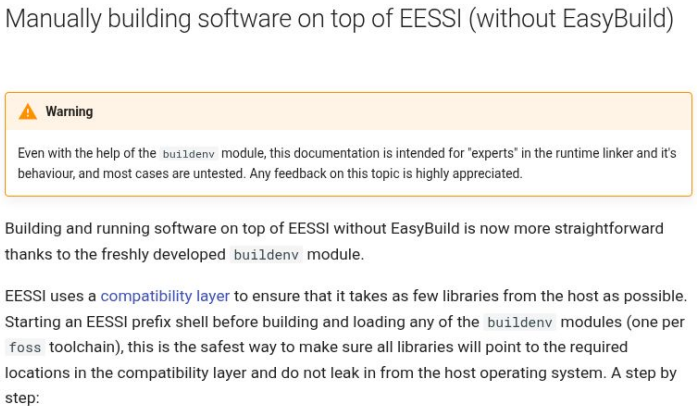
With EasyBuild

- Just `module load EESSI-extend`!

Wrapper module to set up all the environment for you

With pain and suffering

- Load `buildenv` module
- Procedure is documented
- Most cases untested and undocumented, we appreciate feedback!



Manually building software on top of EESSI (without EasyBuild)

Warning

Even with the help of the `buildenv` module, this documentation is intended for "experts" in the runtime linker and it's behaviour, and most cases are untested. Any feedback on this topic is highly appreciated.

Building and running software on top of EESSI without EasyBuild is now more straightforward thanks to the freshly developed `buildenv` module.

EESSI uses a compatibility layer to ensure that it takes as few libraries from the host as possible. Starting an EESSI prefix shell before building and loading any of the `buildenv` modules (one per `foss` toolchain), this is the safest way to make sure all libraries will point to the required locations in the compatibility layer and do not leak in from the host operating system. A step by step:

With Spack...? 🤭

https://www.eessi.io/docs/blog/2026/02/05/Spack-on-top-of-EESSI-best-of-both-worlds

https://www.eessi.io/docs/using_eessi/building_on_eessi

dev.eessi.io

software.eessi.io (production)

- Permanent installations
- Only install releases
- Builds for all CPU architectures
- `/cvmfs/software.eessi.io/version/`

```
/cvmfs/dev.eessi.io/versions/2023.06/software
`-- linux
    `-- x86_64
        |-- amd
        |   |-- zen2
                |-- modules
                    |-- all
                        |-- ESPResSo
                        |   |-- 4.2.2-foss-2023a-2ba17de6096933275abec0550981d9122e4e5f28.lua
                        |-- GROMACS
                        |   |-- 2024.3-foss-2023b-d0f934abfd1394621c40858a2c2dd9123451df4e.lua
                        |-- LAMMPS
                        |   |-- 570c9d190fee556c62e5bd0a9c6797c4dffcc271-foss-2023a-kokkos-dev_OBMD.lua
                        |-- ...
```

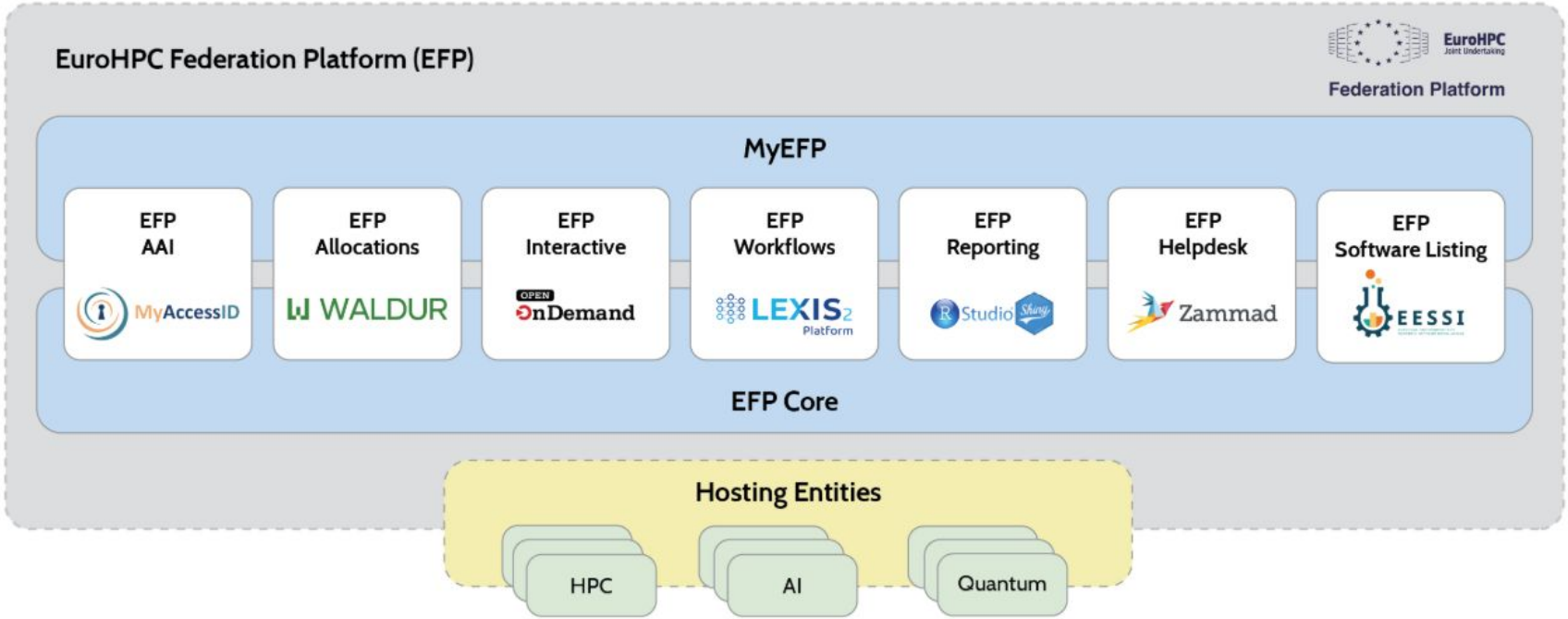
dev.eessi.io

- Temporary installations
- Can install from commits
- Patches can be added
- Can skip some CPU targets
- dev.eessi.io built on top of software.eessi.io
- Subdirectories per project
- `/cvmfs/dev.eessi.io/project/version/`

Currently only available for codes within the MultiXscale project!

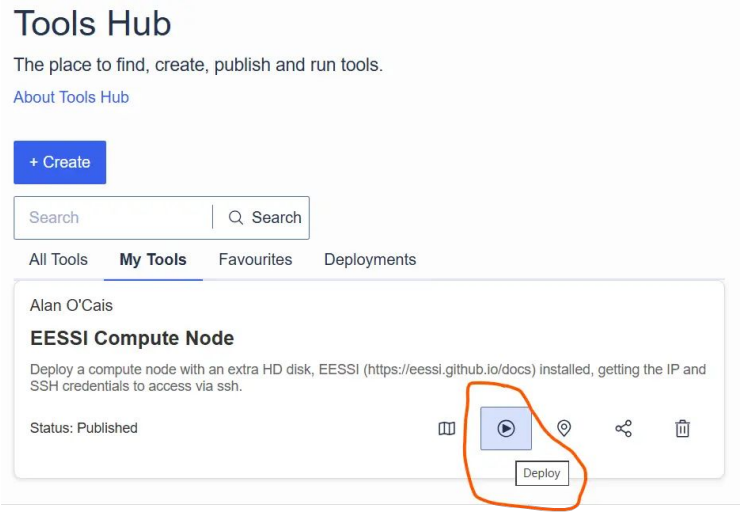
Further integrations

European Federation Platform (EFP)



https://my-eurohpc.eu

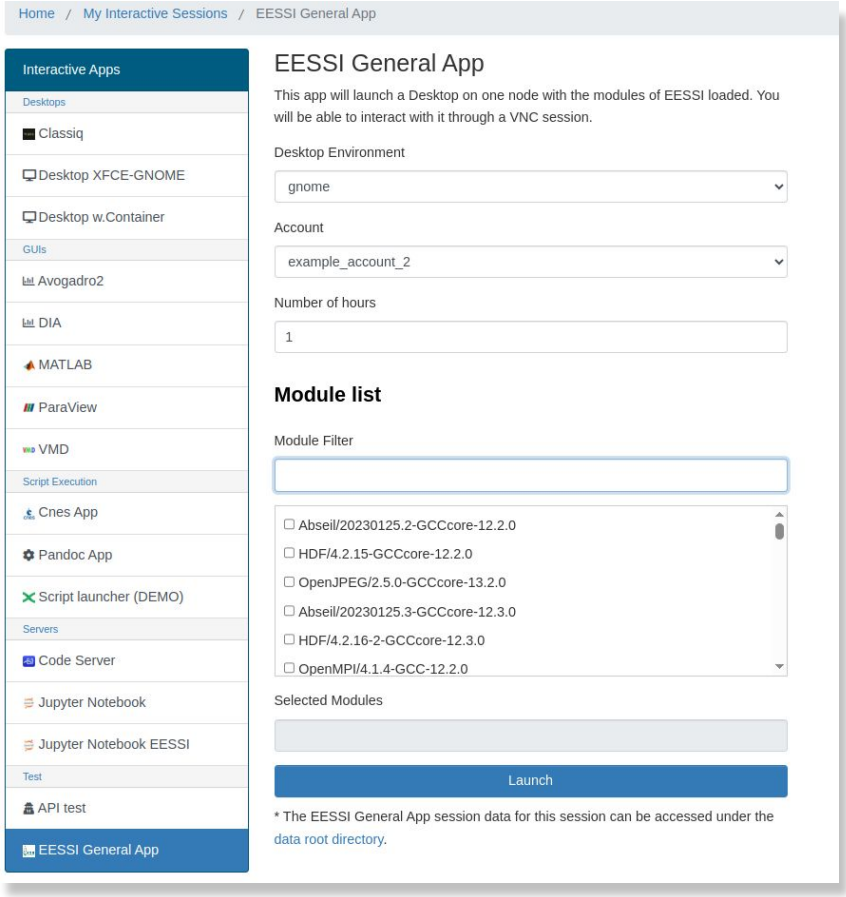
European Open Science Cloud (EOSC)



https://eessi.io/docs/blog/2025/10/22/eosc/

Open OnDemand (OOD)

- Web Desktop Based application
- Modules field to select software needed by the user
- Selected modules unwritable field to check the selected ones
- Search mechanism to find specific modules



Spack

Using Spack on top of EESSI: A Proof of Concept

EESSI provides a rich set of software installations, which were built and installed using EasyBuild.

Can we convince Spack to reuse software installed in EESSI, and by doing so make EESSI more attractive to those of you who prefer using Spack over EasyBuild?

Several people have expressed interest in exposing the software installations provided by EESSI to Spack, so they can be used as dependencies when building and installing software with Spack.

https://eessi.io/docs/blog/2026/02/05/Spack-on-top-of-EESSI-best-of-both-worlds

Trainings & dissemination

EESSI Happy Hours

Come join us every Monday!!!!!!

🍹👯🥳

EESSI Happy Hour sessions

provided by EuroHPC CoE MultiXscale

What if you no longer have to install a broad range of scientific software from scratch on every laptop, HPC cluster, or cloud instance you use or maintain, without compromising on performance?

The European Environment for Scientific Software Installations EESSI comes to the rescue!

Join us for EESSI Happy Hour, an informal, weekly online session to explore and discuss key EESSI topics and updates with the community.

Each series will focus on a specific main topic over several sessions, giving participants the opportunity to ask questions, get hands-on guidance, and share experiences.

🧭 *Where?* Online, via Zoom **(click here to join!)**

⏰ *When?* **Mondays, 14:00-15:00 CE(S)T**

💬 *Who should join?* Everyone interested in EESSI.

Older sessions available in YouTube https://www.youtube.com/@eessi_community

Webinars series (2025)

- Introduction to EESSI
- Introduction to CernVM-FS
- Introduction to EasyBuild
- EESSI for CI/CD
- Using EESSI as the base for a system stack

https://eessi.io/docs/training-events/2025/webinar-series-2025Q2/

Webinars series - spring 2026

- Introduction to EESSI (27 April 2026)
- Building software on top of EESSI + contributing to EESSI (4 May 2026)
- Using EESSI for Continuous Integration (11 May 2026)
- Introduction to CernVM-FS (18 May 2026)
- Using EESSI as a base for a central software stack (1 June 2026)

https://eessi.io/docs/training-events/2026/webinar-series-2026Q2/

Hackathons, and other events

HPCKP 2025, Bcn

ISC 2025, Hamburg

EESSI

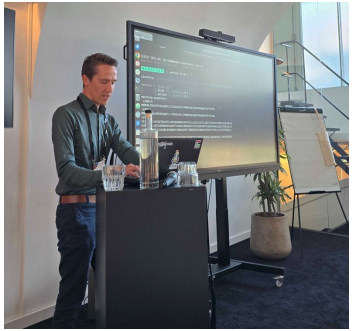
Copenhagen, EuroHPC User days 2025

Spotify podcast!↓

EESSI
EUROPEAN ENVIRONMENT FOR SCIENTIFIC SOFTWARE INSTALLATIONS

HIPEAC 2025, Bcn

RSE Days Belgium 2025



SURF Research days 2025

SUPERCOMPUTING IN EUROPE

SC 2024, Atlanta

EasyBuild User Meeting 2025, JSC

And much more to come!

EESSI won an HPCWire Reader's Choice award!

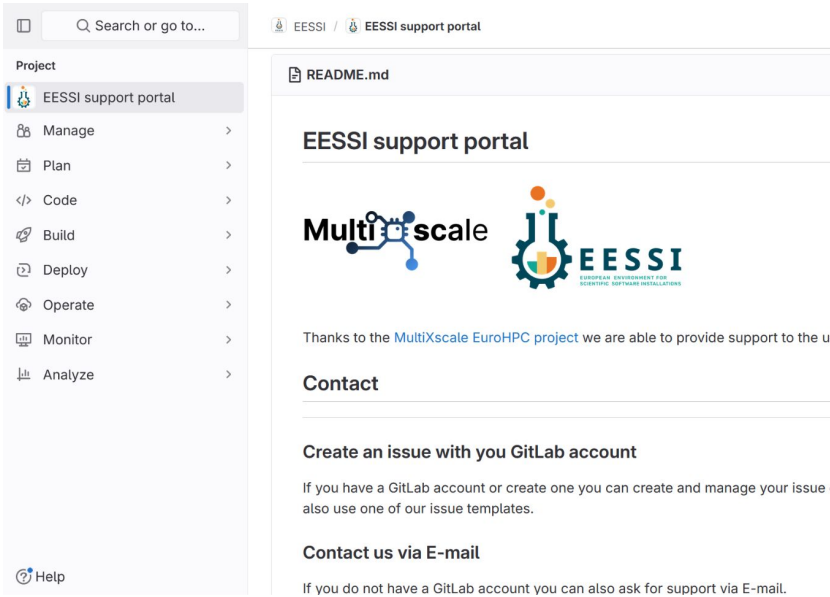
eessi.io/docs/blog/2024/11/18/hpcwire-readers-choice-awards-2024-for-eessi

Support for installing, using, contributing to EESSI

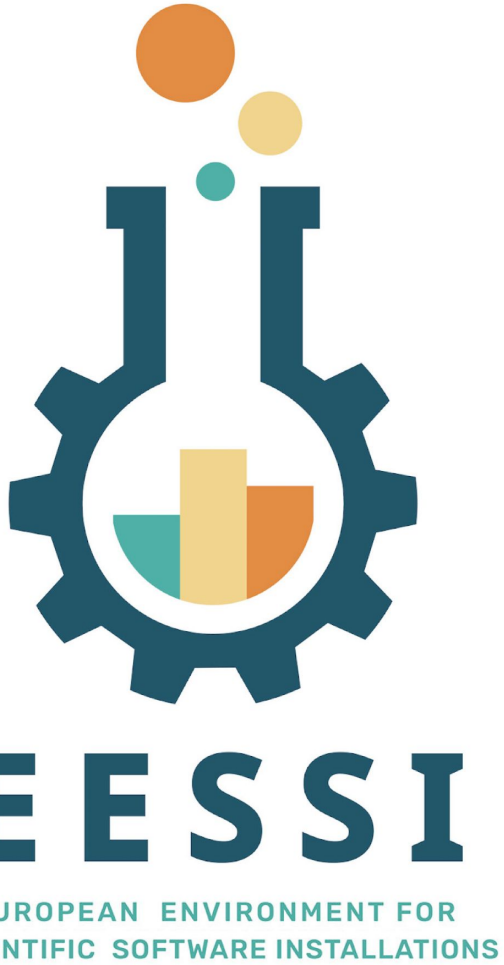
GitLab

eessi.io/docs/support

- **Via GitLab, or via email:** `support@eessi.io`
- Report problems
- Ask questions
- Request additional software
- Get help with contributing to EESSI
- Suggest enhancements, additional features, …
- Confidential tickets possible (security issues, …)



Dedicated support team, thanks to EuroHPC Centre-of-Excellence Multiscale



Website: eessi.io

GitHub: github.com/eessi

Documentation: eessi.io/docs

Blog: eessi.io/docs/blog

Join the EESSI Slack

YouTube channel: youtube.com/@eessi_community

Paper (open access): doi.org/10.1002/spe.3075

EESSI support portal: gitlab.com/eessi/support

Bi-monthly online meetings (1st Thu, odd months, 2pm CE(S)T)

Richard

MultiXscale

Co-funded by the European Union

EuroHPC Joint Undertaking

Web page: multixscale.eu

Facebook: MultiXscale

Twitter: @MultiXscale

LinkedIn: MultiXscale

BlueSky: MultiXscale

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Universität Stuttgart

UNIVERSITAS BERGENSIS

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Université de Toulouse

Consiglio Nazionale delle Ricerche

MAX-PLANCK-GESELLSCHAFT

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university of groningen

SURF

JÜLICH Forschungszentrum

GHENT UNIVERSITY

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Funded by the European Union. This work has received funding from the European High Performance Computing Joint Undertaking (JU) and countries participating in the project under grant agreement No 101093169.